



SLOVENSKI STANDARD
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Refrigerating systems and heat pumps - Safety and environmental requirements - Part 3:
Installation site and personal protection

Kälteanlagen und Wärmepumpen - Sicherheitstechnische und umweltrelevante
Anforderungen - Teil 3: Aufstellungsort und Schutz von Personen

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Systemes de réfrigération et pompes à chaleur - Exigences de sécurité et
d'environnement - Partie 3: Installation in situ et protection des personnes

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Ta slovenski standard je istoveten z: EN 378-3:2000

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27.080

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en

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English version

Refrigerating systems and heat pumps - Safety and
environmental requirements - Part 3: Installation site and
personal protection

Systèmes de réfrigération et pompes à chaleur - Exigences
de sécurité et d'environnement - Partie 3: Installation in situ
et protection des personnes

Kälteanlagen und Wärmepumpen - Sicherheitstechnische
und umweltrelevante Anforderungen - Teil 3:
Aufstellungsort und Schutz von Personen

This European Standard was approved by CEN on 10 October 1999.

CEN members are bound to comply with the CEN/GENELEC Internal Regulations which stipulate the conditions for giving this European Standard the status of a national standard without any alteration. Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the Central Secretariat or to any CEN member.

This European Standard exists in three official versions (English, French, German). A version in any other language made by translation under the responsibility of a CEN member into its own language and notified to the Central Secretariat has the same status as the official versions.

CEN members are the national standards bodies of Austria, Belgium, Czech Republic, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and United Kingdom.

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EUROPEAN COMMITTEE FOR STANDARDIZATION
COMITÉ EUROPÉEN DE NORMALISATION
EUROPÄISCHES KOMITEE FÜR NORMUNG

Central Secretariat: rue de Stassart, 36 B-1050 Brussels

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Foreword

This European Standard has been prepared by Technical Committee CEN/TC 182 "Refrigerating systems, safety and environmental requirements", the secretariat of which is held by DIN.

This European Standard shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by July 2000, and conflicting national standards shall be withdrawn at the latest by July 2000.

This European Standard has been prepared under a mandate given to CEN by the European Commission and the European Free Trade Association, and supports essential requirements of EU Directive(s).

For relationship with EU Directive(s), see informative Annex ZA, which is an integral part of this standard.

According to the CEN/CENELEC Internal Regulations, the national standards organizations of the following countries are bound to implement this European Standard: Austria, Belgium, Czech Republic, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and the United Kingdom.

NOTE 1: It should be noted that this standard at the time of publication does not satisfy all essential safety requirements of the Directive 97/23/EC.

NOTE 2: This European Standard had also been proposed for inclusion in the mandate under the EU Directive 89/392/EEC (Machinery Directive). As the mandate has been given after the Standard had been accepted by the Technical Committee for submission to formal vote and in order not to further delay its publication, it will be reviewed within the context of the latest version of the Machinery Directive directly after the publication.

This EN 378-3 is part of a standard consisting of a series of the following parts:

- Part 1 Basic requirements, definitions, classification and selection criteria
- Part 2 Design, construction, testing, marking and documentation
- Part 3 Installation site and personal protection
- Part 4 Operation, maintenance, repair and recovery

For the 6-month enquiry, the draft standard was issued in 13 parts. After the discussion of the comments received during the enquiry it was decided to rearrange the content of 12 parts and to publish the final standard in the above 4 parts. The remaining part 13 will be published as a separate standard.

The annexes A, B, C, D and ZA of this European Standard are informative.

Introduction

The introduction of EN 378-1 is applicable.

1 Scope

1.1 The scope of EN 378-1 is applicable.

1.2 This Part 3 of the European Standard is applicable to the installation site (design of plant space and services) and personal protective equipment.

1.3 This Part 3 is not applicable to unit systems and self-contained systems which operate with charges of refrigerant up to

2,5 kg of group L1 refrigerant,
1,5 kg of group L2 refrigerant, and
1,0 kg of group L3 refrigerant.

1.4 Certain clauses and subclauses of this Part 3 are not applicable to systems built on site with charges of refrigerant up to

2,5 kg of group L1 refrigerant,
1,5 kg of group L2 refrigerant, and
1,0 kg of group L3 refrigerant.

These clauses are:

clause 5 and 6.1.2.

1.5 Certain clauses and subclauses of this Part 3 are not applicable to unit systems and self-contained systems which operate with charges of refrigerant up to

10,0 kg of group L1 refrigerant, and
2,5 kg of group L2 refrigerant.

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These clauses are:

clause 5;
6.1.2; 6.2.3; 6.2.4;
clause 7.

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1.6 For refrigerating systems with a refrigerant charge of up to 10,0 kg of group L1 and up to 2,5 kg of group L2 and L3, clause 9 is only applicable to personnel doing maintenance, repair and recovery.

2 Normative references

This European Standard incorporates, by dated or undated reference, provisions from other publications. These normative references are cited at the appropriate places in the text and the publications are listed hereafter. For dated references, subsequent amendments to or revisions of any of these publications apply to this European Standard only when incorporated in it by amendment or revision. For undated references, the latest edition of the publication referred to applies.

EN 378-1

Refrigerating systems and heat pumps – Safety and environmental requirements – Part 1: Basic requirements, definitions, classification and selection criteria

EN 378-2

Refrigerating systems and heat pumps – Safety and environmental requirements – Part 2: Design, construction, testing, marking and documentation

3 Definitions

For the purposes of this European Standard the definitions given in EN 378-1 apply.

4 General requirements

4.1 Installation in relation to occupancies

When installing the system the refrigerant and type of system shall not differ from that selected in EN 378-1 having due regard to the occupancy relevant to the premises for which the refrigerant is utilized so that persons are not endangered.

4.2 Special machinery rooms

Special machinery rooms shall be installed as specified for their design and construction in clause 5.

4.3 Fire extinguishing components

Fire extinguishers shall be in accordance with the requirements of the local fire authorities. The extinguishing fluid shall be selected carefully, since dangerous chemical reactions may occur between certain extinguishing fluids and certain refrigerants.

4.4 Installation of piping, valves and their components

The installation of piping, valves and their components shall be as specified in EN 378-2.

4.5 Refrigerating equipment in the open air

Refrigerating equipment installed in the open air shall be suitable for outside installation. This equipment shall not be accessible to unauthorized persons. If refrigerating equipment is located on a roof care shall be taken that no refrigerant leaking from this equipment can enter the building or otherwise endanger people.

5 Design and construction of special machinery rooms

5.1 General

In some cases special machinery rooms shall be provided for accommodating parts of refrigerating systems, especially those of the high pressure side, and the compressors, for reasons of safety.

NOTE: Housings kept tight and vented can also serve as special machinery rooms.

The following principles apply to special machinery rooms:

- a) special machinery rooms shall serve for accommodating refrigerating equipment but need not serve exclusively for this equipment;
- b) refrigerant gas escaping from special machinery rooms shall be prevented from entering neighbouring rooms, staircases, courts, gangways or building draining systems and the escaping gas shall be vented without risk;
- c) it shall be possible to leave the special machinery room immediately in case of danger;
- d) the air supply for combustion engines, boilers or air compressors shall be drawn from a place, where there is no refrigerant gas. If such equipment is installed in a special machinery room, the air shall be supplied from outside the room;
- e) there shall be no open flame-producing equipment permanently installed and operated. Flammable materials, other than refrigerants, shall not be stored in the special machinery room;
- f) a remote switch for stopping the refrigerating system shall be provided outside and near the special machinery room door;
- g) natural or mechanical ventilation shall be provided. Mechanical ventilation shall be provided with independent emergency control located outside the machinery room and near the machinery room door;
- h) exterior openings shall not be under emergency exit staircases;
- i) all piping and ducting passing through walls, ceilings and floors of special machinery rooms shall be tightly sealed;
- j) portable fire extinguishers shall be provided in each special machinery room in an adequate number appropriate to the size and type of the system and the type of refrigerant, heat-transfer medium and insulation. For systems using flammable refrigerants fire extinguishers shall also be provided in the proximity of the entries of cold rooms and to working spaces in which refrigerating equipment is located.

5.2 Warning notice

Special machinery rooms shall be clearly marked as such on the entries together with warning notices that unauthorized persons shall not enter and that smoking, naked lights or flames are prohibited. Additionally, warning notices shall be displayed prohibiting unauthorized operation of the system.

5.3 Dimensions and accessibility

The dimensions of the special machinery room shall allow the installation of equipment in favourable conditions, leaving sufficient room for service, maintenance, operation and disassembly. If a housing serves as a special machinery room, the access for service and maintenance can be achieved by dismantling parts of the housing or by special doors.

If necessary, catwalks and fixed ladders shall be provided for the erection, operation, maintenance and inspection of the system in order to avoid standing or walking on piping, fittings, their supports and supporting structures and on components.

There shall be clear headroom of at least 2 m below equipment situated over gangways and permanent work places.

5.4 Doors and walls

5.4.1 Doors and openings

Special machinery rooms shall have doors opening outwards and adequate in number to ensure freedom for persons to escape in an emergency.

The doors shall be so designed that they can be opened from inside (anti-panic system).

The doors shall be self-closing if they provide access into the building.

The doors shall have at least a 30 min fire resistive construction.

There shall be no openings that permit unintended passage of escaping refrigerant, vapours, odours and all other gases to other parts of the building.

5.4.2 Inner walls

All partitions (horizontal or vertical) between the special machinery room and the inside of the building shall have at least a 1 h fire resistive construction and be tightly sealed.

The doors in these partitions shall have at least a 1 h fire resistive construction (at least 30 min for doors in an entry air lock, etc.) and be tightly fitting and self-closing.

5.5 Ventilation

5.5.1 General

Special machinery rooms shall be ventilated by means of natural ventilation through windows, grilles, vent holes, or by mechanical ventilation to the outside of the building such as not to cause inconvenience or danger to persons or goods. The ventilation shall be sufficient both for normal operating conditions and emergencies. The required capacity shall be determined by 5.5.2 or 5.5.3.

Provisions shall be made for a sufficient supply of outside replacement air and a good distribution of that air over the special machinery room without blind angles. Openings for outside air shall be positioned to avoid short circuiting.

NOTE: Ducts may be required for ventilation.

Refrigerants may be heavier or lighter than air. For heavier than air refrigerants, at least 50 % of the discharge volume is taken from the lowest point in the special machinery room and the outside air inlet shall be near the highest point. For lighter than air refrigerants, the discharge volume shall be taken from the highest point and the outside air inlet shall be near the lowest point.

In special machinery rooms with an entirely or partly underground construction or other special machinery rooms where natural ventilation is not possible, e.g. on ships and in mines, mechanical ventilation shall operate when personnel are present. When no personnel are present, emergency ventilation shall be automatically controlled by a refrigerant detector.

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5.5.2 Natural ventilation

The total free opening area for the natural ventilation of the special machinery room shall be at least

$$A = 0,14 \times m^{1/2}$$

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where:

- A is the free opening area, in square metres;
- m is the mass of refrigerant charge, in kilogrammes, in the refrigerating system with the largest charge, any part of which is located in the special machinery room;
- 0,14 is the relationship between area and mass, in square metres divided by the root of kilogrammes.

Free flow through windows, grilles and vent holes or ducts shall not be hampered by walls or fences, shaft walls, adjacent buildings or other obstructions, and consideration shall be given to the density of the refrigerant.

5.5.3 Mechanical ventilation

Mechanical ventilation shall be by fans capable of removing from the special machinery room at least

$$V = 14 \times m^{2/3}$$

where:

V is the flow, in litres per second;

m is the mass of refrigerant charge, in kilogrammes, in the refrigerating system with the largest charge, any part of which is located in the special machinery room;

14 is a conversion factor.

The ventilation system shall not be required to produce more than 15 air changes per hour.

It shall be possible to switch the fans on and off both in and outside the special machinery room. In the case of special machinery rooms completely or partly installed underground the operating switch outside the special machinery room shall be located on the ground floor.

Fan motors which are likely to operate in spaces with risk for flammable gas/air mixtures shall be placed outside the air stream or comply with the requirements for hazardous areas (explosion proof). The construction and materials of the fans shall not contribute to fire or sparking.

5.6 Special machinery rooms for group L2 refrigerants

5.6.1 Emergency exits

At least one emergency exit shall open directly to the open air, otherwise it shall lead to an emergency exit passageway.

The doors in this emergency exit passageway shall be such that they can be opened manually from inside the machinery room (anti-panic system).

5.6.2 Absorption of ammonia

5.6.2.1 Water supply

Due to the high absorption capacity of ammonia gases in water, a water supply for manual spraying or a water screen in each special machinery room shall be considered according to circumstances. The water supply connection shall be such that no contaminated water can flow back into the main.

5.6.2.2 Contaminated water

If a water supply is installed, measures shall be taken to ensure that the contaminated water is collected in appropriate vessels and disposed of safely.

5.7 Special machinery rooms for group L3 refrigerants

5.7.1 Minimum conformity criteria requirements

Special machinery rooms for refrigerating systems using a group L3 refrigerant shall meet the requirements of 5.6.1 and shall be constructed according to the regulations applying to spaces presenting an explosion hazard.

5.7.2 Explosion relief

Some explosion relief (e.g. frangible wall or roof) shall be provided, if it is possible for the concentration of refrigerant to reach the lower flammability limit.

6 Electrical installations

6.1 General arrangements

6.1.1 Main power supply

The electrical power supply to a refrigerating system shall be arranged so that it can be switched off independently of the electricity supply to other electrical equipment in general and, in particular, to any lighting system, ventilation unit, alarm and other safety equipment.

6.1.2 Mechanical ventilation

Fans, supplied in accordance with 5.5 for the ventilation of rooms containing refrigerating equipment shall be so arranged that they can be controlled by switching arrangements both inside and outside the rooms.

6.1.3 Normal lighting

Permanent luminaires shall be selected and positioned in spaces containing refrigerating equipment to provide adequate illumination for safe operation.

6.1.4 Emergency lighting

A fixed or portable emergency lighting system shall be provided, adequate to allow operation of controls and evacuation of personnel, when normal lighting fails.

6.1.5 Alarm system

A refrigerant leak alarm system (see 6.2.5.3) shall be powered by an independent emergency system e. g. battery back up installed in accordance with European standards.

6.2 Special arrangements

6.2.1 Condensation

Where moisture from condensation may contact electrical equipment, such equipment shall be suitable.

6.2.2 Trickling water

Special care shall be taken to avoid water trickling on electric panels and individual electric equipment.

6.2.3 Flammable refrigerants

Some of the group L2 refrigerants and all group L3 refrigerants are flammable. Where the charge of flammable refrigerants in any refrigerating system exceeds the amount of 2,5 kg of group L3 refrigerant or 25 kg of flammable group L2 refrigerant (except for ammonia, see also 6.2.4 and 6.2.5), all electrical equipment in any room in which any part of the refrigerating system is installed shall comply with the requirements for hazardous areas.

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6.2.4 Ammonia (R-717) in rooms with electrical equipment

Electrical equipment in rooms in which a refrigerating system containing ammonia is located need not conform to requirements for hazardous areas.

6.2.5 Ammonia (R-717) in special machinery rooms

6.2.5.1 General

Special machinery rooms in which a refrigerating system containing ammonia with a charge of more than 10 kg is located, shall comply with 6.2.5.2 and 6.2.5.3.

6.2.5.2 Electrical switches

Switches shall be provided to disconnect all electrical circuits entering the room (except low voltage alarm circuits). These switches shall be of the totally enclosed type or shall be located outside the special machinery room.

Automatic switches shall be activated to disconnect their circuits by ammonia detectors.

6.2.5.3 Ventilation

The special machinery room shall be provided with a mechanical ventilation system used exclusively for the special machinery room. The minimum air moving capacity of the system shall be in accordance with 5.5.3. This ventilation system shall be activated by an ammonia detector. The fan motor and associated electrical equipment shall be of the explosion proof type or shall be located outside the special machinery room and the ventilation air stream.

Failure of the mechanical ventilation system shall initiate a supervised alarm so corrective action can be taken.

7 Detectors and alarms

7.1 General

The location of the detectors shall be chosen in relation to the refrigerant.

Refrigerant detectors are intended to give early warning of a dangerous concentration of refrigerant vapour in the surrounding air of a refrigerating system and of pollution of the environment.

7.2 Special machinery rooms

The refrigerant concentration in each special machinery room shall be monitored at one or more points to activate an alarm covering human occupied spaces and possibly shut off parts of the system.

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7.3 Large refrigerant charges

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For a refrigerating system with a refrigerant charge of more than 500 kg, measures shall be taken to detect the presence of refrigerant in any associated circuit containing water or other liquids.

7.4 Refrigerant detectors to warn of dangerous concentrations

7.4.1 Refrigerating systems with group L1 or odourless group L2 refrigerant

If a refrigerating system with either a group L1 refrigerant or an odourless group L2 refrigerant is equipped with refrigerant detectors then they shall function at a concentration not exceeding the practical limits of refrigerant in air as indicated in EN 378-1.